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piration (4), the endotracheal tube is a well-known major risk factor for ventilator-associated pneumonia, as it permits leakage of pharyngeal secretions around the cuff.

In our randomized controlled trial (5) of 165 patients included in the intervention group, only 9 (5%) required reintubation. A few of these patients could perhaps benefit of the evaluation proposed by Stocchetti et al and avoid an undue extubation; the duration of mechanical ventilation for the overall patients, however, would have been certainly much higher.

The authors have no potential conflicts of interest to disclose.

Paolo Navalesi, MD, on behalf of all authors, Intensive Care Unit, SCDU Anestesia, Terapia Intensiva e Rianimazione Generale, Università del Piemonte Orientale "A. Avogadro," Azienda Ospedaliera Universitaria "Maggiore della Carità," Novara, Italy; Anna Levati, MD, Azienda Ospedaliera della Provincia di Pavia, Pavia, Italy

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### Hematocrit causes the most significant error in point of care glucometers

**To the Editor:**

The study by Hoedemaekers et al (1) has failed to identify the most likely and proven confounder for accuracy of point-of-care (POC) glucometers used in the intensive care unit: hematocrit. A cursory review of the literature reveals that the effect of low patient hematocrit is to systematically elevate measurements in single-channel POC glucometers (2, 3). The whole blood samples used by all single-channel POC glucometers fail to account for reduced plasma displacement by fewer red blood cells, thus artificially elevating the reported glucose value. This problem is exacerbated by the simultaneous adoption of tight glucose control (4, 5) and restrictive transfusion practices (6) in many hospitals that use POC glucometers (7). Application of the recommendation by Hebert et al for permissive anemia effectively decreases hematocrit to the range of approximately 21%. Our research has identified the level of unacceptable performance of single-channel POC glucometers to occur at 34% hematocrit (8). We have developed a simple mathematical correction formula for the top four POC devices used in the United States that reduces the substantial inaccuracy caused by anemia to a margin of error less than 5% from the reference laboratory value (8).

Use of POC glucometers in the intensive care unit is a necessary evil in the era of tight glucose control as noted by Juneja and Zito (9); however, single-channel devices may be safely used with an awareness of this acknowledged hematocrit effect given the subsequent correction (8). Recent release of new commercially available technology in a four-channel POC glucometer (StatStrip, Nova Biomedical, Waltham, MA) provides intensive care unit clinicians with a reliable device unaffected by reduced hematocrit and most potentially interfering substances in the whole blood sample (10). POC testing at the bedside in the intensive care unit can be safely accomplished with the existing technology using hematocrit correction factors or multichannel POC devices.

The authors have not disclosed any potential conflicts of interest.

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### The authors reply:

We thank Dr. Mann et al for their comments on our article regarding bedside glucometry in critically ill patients (1). We agree that high and low hematocrit levels can influence glucose measurements (2, 3). We tested the effects of hematocrit on the performance of different point-of-care testing devices and did not find any positive or negative correlation in our patient cohort. The authors state that low hematocrit values systematically elevate measurements in single-channel point-of-care glucometers. According to the literature, however, the effect of low hematocrit on glucose values depends on the point-of-care testing device that is used: both overestimation and underestimation of the glucose values have been reported in patients with low hematocrit levels (2). In addition, the au-



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thors claim that a mathematical correction formula can reduce the inaccuracy caused by changes in hematocrit to <5% from the reference glucose value (4). This mathematical correction is developed using glucose and hematocrit values of a cohort of critically ill patients. Because no validation studies using this correction factor have been published so far, it should be used with great caution.

The authors have not disclosed any potential conflicts of interest.

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### Liberation from mechanical ventilation in the neurocritically ill

**To the Editor:**

We read with great interest the article by Navalesi et al (1). Liberation from mechanical ventilation (MV) is a daily struggle point for intensivists taking care of patients with brain injury. In recent years, several randomized controlled trials have demonstrated improved outcomes for MV patients managed under discontinuation protocols. Such protocols have been investigated with success in medical (2) and surgical critical care populations leading to published guidelines (3). How can we apply this accumulated knowledge in mechanically ventilated, critically ill patients with primary brain injury? Most of the relevant randomized controlled trials do not include patients with brain injury, and there are very few publications addressing the specific and unique needs of patients with primary neurologic impairment.

We congratulate the authors for completing the first randomized controlled trial comparing protocolized liberation from MV vs. physician driven, nonprotocolized, discontinuation in neurocritically ill patients. This is indeed the first study that incorporates measures of neurologic function (Glasgow Coma Scale [GCS] and ability to cough) within an *a priori* defined protocol for MV liberation, applied within a dedicated neurointensive care unit. We would like, although, to question the decision of the investigators to not include in their study cohort, patients on continuous sedation and/or controlled MV. Obviously, these patients would fail daily "readiness" screening but nevertheless would be part of the studied population. By not including all MV patients, the authors are investigating a group that has already passed a major hurdle in the process of MV discontinuation. As a result, they have excluded 109 patients who died and 47 patients who were tracheostomized. This could potentially explain the overall low numbers of reintubation rates, days of MV, intensive care unit (ICU) stay, tracheostomy, and ICU mortality.

The GCS, despite being a crude, imperfect assessment of neurologic function, remains the most commonly used measure by clinicians assessing suitability for extubation. Interestingly, Coplin et al (4) has challenged this notion by finding that a GCS $\leq$8 did not preclude successful extubation but was associated with prolonged MV resulting in a fourfold increase in VAP. In contrast, Namen et al (5) showed that GCS $\geq$8 significantly increases the chances of a successful extubation attempt. In the current study, all patients who were extubated, irrespective of group assignment had an average GCS of 10. It is usually with the lower GCS scores, closer to the "magical" cutoff point of 8, which most of us struggle with the decision to extubate or not vs. moving directly to tracheostomy. Furthermore, tracheostomy is a common procedure in the ICU and maybe even more common within Neuro-ICUs. Besides a very low rate of tracheostomy within the studied population, the criteria for tracheostomy are not specified by Navalesi et al and tracheostomy was not part of the protocolized regimen.

The authors showed a decreased reintubation rate with protocol implementation, nevertheless and before a wider implementation of protocolized "weaning" in neuro-ICUs, we need a deeper understanding of the reasons for discontinuation failure and better predictors of successful extubation in neurocritically ill patients. Such information could be gained by randomized controlled trials that include all MV patients with primary brain injury, testing rigorous protocols that combine standard criteria with neurologic criteria and incorporate the decision to offer a tracheostomy.

The authors have not disclosed any potential conflicts of interest.

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